

Case Study

Year 2000 Preparation at Water and Wastewater Utilities

Orange County Sanitation District



This case study report is part of a series of Year 2000 (Y2K) preparation case studies prepared for the EPA Office of Water and the State of California. These case studies review the process and status of Y2K preparations of three water and/or wastewater utilities of varying sizes. The Y2K bug is the computer glitch that can cause computers and computerized equipment to not properly recognize the year 2000. For many years computer programmers used only the last two digits of the year when writing the date into computer code. When the year changes from 1999 to 2000, computers may read the year as 1900. As a result, computers and computerized equipment may shut down, malfunction, or simply perform business as usual. Computers that perform business as usual may encounter problems at other dates, however, such as February 29 (the year 2000 is a leap year, but 1900 was not). See the Appendix for a list of dates with possible Y2K problems.

The Y2K bug can affect numerous systems in water and wastewater utilities. Not only can the computer systems monitoring and controlling plant operations be non-compliant, but much of the plant equipment can also be non-compliant. Many devices, such as electronically controlled pumps and valves, may have computer chips embedded in them that have an internal clock. Sometimes this clock will show up on a digital display on the device, but many times it cannot be seen at all. In addition to all the embedded operating systems and computer controls, utilities have business-related computer hardware and software that can be affected, and they rely on vendors and suppliers who must also cope with Y2K issues.

With the vast amount of work that must be performed to prepare water and wastewater utilities for Y2K and the limited time in which the work must be done, these case studies are designed to assist utilities that are not as far along in their Y2K preparations. The utilities featured in these case studies are considered to be leaders with regard to the amount of work they have done to prepare for the Y2K bug and their progress toward finishing preparations. In their preparations, these utilities have learned from their experience, and these case studies are intended to pass on this knowledge.

Table of Contents

1. SYSTEM OVERVIEW.....	1
2. MOTIVATING FACTORS.....	1
3. GENERAL Y2K APPROACH.....	2
3.1 Awareness Building.....	3
3.2 Inventory	3
3.3 Assessment	4
3.4 Contingency Plans	4
3.5 Implementation.....	4
4. SYSTEM REVIEWS.....	4
4.1 Control System.....	5
4.2 Embedded Systems	6
4.3 Laboratory.....	10
4.4 Business Systems	11
5. EXTERNAL INFLUENCES	13
5.1 Source Control	13
5.2 Vendors.....	14
6. CONTINGENCY PLANNING	14
6.1 Staffing.....	14
6.2 Energy and Other Services.....	15
Appendix: Critical Y2K Dates	17

1. SYSTEM OVERVIEW

The Orange County Sanitation District is a wastewater treatment utility located just south of Los Angeles on the Pacific coast. The District's service area covers 471 square miles and serves a population of approximately 2.2 million. Founded in 1948, it became a formal sanitation district in 1954. Much of the infrastructure in use today, however, was built and/or rebuilt in the 1970s and 1980s.

The District consists of two large treatment plants, which include primary treatment and secondary treatment with activated sludge and trickling filters; 650 miles of sewer trunk lines; and 22 pumping stations. The smaller sewer lines, totaling approximately 7,000 miles, and connections are maintained by the cities within the District. Effluent from the District is discharged out a five-mile-long, ten-foot-diameter ocean outfall pipe. The last mile of the pipe is the diffuser section, which is about 190 feet below sea level. The effluent is half primary treated and half secondary treated wastewater. Average flow into the plants is 243 million gallons per day (MGD), with a total capacity of more than 480 MGD. The winter is the area's rainy season, and winter storms can cause the plants to reach full capacity.

About 10 MGD of water is reclaimed and sent to the neighboring Orange County Water District for final treatment. It is then used in the seawater intrusion barrier, landscaping, industry, and in the District's own operations. The District produces an average of 500 wet tons per day of biosolids, which are digested, dewatered on belt presses, and used for local landscaping and agriculture. The methane gas from the digesters plus supplemental purchased natural gas is used in the District's onsite electrical generation plants, which generate an average of 10,500 kW of electricity. The electricity generated is more than enough to run the entire District's plant operations. The excess power is sold to the local electric utility.

The District has approximately 520 employees and is governed by a 25-member Board of Directors. The Board consists of mayors or elected council members from the 21 cities in the District, three members from Sanitary Districts located within the service area and one member who represents the unincorporated areas. The District's budget for its 1999 fiscal year is \$154 million, \$45 million of which is for operations, \$72 million for capital projects, and \$37 million for debt service.

2. MOTIVATING FACTORS

District management is determined to do everything possible to stop the Y2K bug from affecting its business or operations. The ramifications from disrupted service could be disastrous. Sewage could flow into the streets or into the Santa Ana River and coastal waters, causing risks to public health and local ecosystems.

The District's mission statement outlines some of the motivating factors for its Y2K program:

"The District's mission is to protect public health and the environment through wastewater systems."

Protection of public health is the highest priority for the District's Y2K program. To protect public health, the District must keep the sewage flowing in the sewer collection pipes, through the treatment plants, and into the ocean via approved outfalls. Protecting the ocean environment by treating the sewage to acceptable ocean discharge limits is the Y2K program's second priority. The third Y2K priority is ensuring compliance with environmental regulations, covering air, land, and water, which requires sampling testing and the accompanying documentation. The fourth and final, Y2K priority is it to keep all aspects of its business running smoothly. The District's priorities often overlap, and many systems affect one or more of the priorities, but they serve as basic guidelines. How these priorities are applied will be discussed in more detail later in this case study.

3. GENERAL Y2K APPROACH

Although the District began thinking about Y2K several years ago, it did not begin project activity until June 1998. Before the project began, there was very little awareness of Y2K issues. In July 1998, the District hired a Chief Information Officer who would head its Y2K Program. He helped raise awareness by making sure that the issue was mentioned at almost every District meeting. As a sign of management's growing awareness of the size and implications of the Y2K issue, the project budget was soon raised from \$500,000 to \$2.1 million for fiscal year 98/99. Total funding for the project is currently about \$3 million.

Other staff instrumental to the project are members of the Information Technology (IT) Department, the manager of the Process Control Integration (PCI) Division, the Senior Engineer responsible for the embedded systems review, and the manager of the Safety and Emergency Response Division. The District has also hired the consulting firm, Bristol Systems, Inc., to assist with all aspects of the project. Although Bristol Systems helps with many aspects of the project, the District wants to perform the bulk of the Y2K work in house. Each employee is the expert in his/her own area, and the Y2K issue covers all areas, so it did not make sense to have outsiders performing an inventory and assessment of areas they knew little about. Bristol Systems, Inc. and the IT Department are meant to be resources for departments and to manage the overall project.

Since employees had the responsibility of assessing their own area, they had a sense of ownership of the project, and all became very involved and cooperative. The overall Y2K Program is broken down into individual projects, each of which is managed by a department. Projects can be broken down further into numerous tasks. The entire program is coordinated using Microsoft Project software.

When projects are finished Bristol Systems and the IT Department audit the documentation of the project to ensure that the project was completed thoroughly and documented sufficiently. The IT Department also reviews biweekly progress reports on each project. All Y2K project documentation resides in a commonly viewable electronic folder, a hard-copy archive, or both. All documents submitted to the hard-copy files are controlled by one person, while documents submitted to the electronic files are controlled by designated project personnel. The District is very diligent about documenting every aspect of its Y2K Program in order to exhibit due care for liability purposes.

The District has been following a five-step process in performing its Y2K Program:

- ▶ Awareness building
- ▶ Inventory
- ▶ Assessment
- ▶ Contingency planning
- ▶ Implementation

3.1 Awareness Building

This step has been completed for the most part and was performed by the IT Department, led by the new Chief Information Officer. Awareness was built by educating all levels of staff about the Y2K issue and its implications for the District.

3.2 Inventory

The second step is developing an inventory. This step involves identifying every item in the District that could be affected by Y2K. The inventory is divided into software and hardware and is further divided by department or areas of expertise. The inventory is a very important step because if any non-compliant items are missed, they could cause disruptions on critical dates. This step is ongoing because as new items are being purchased, they must be inventoried. Early on the District rewrote its purchase contracts to state that all purchased items must be guaranteed as Y2K compliant. However, to be sure that new items are compliant, the Purchasing Department must include them in its inventory and assessment.

After much of the inventory had been completed, and departments were more familiar with the type of equipment that could be affected by Y2K, some preliminary contingency planning was done so that major purchase requests, such as generators, could enter the purchasing process early enough to be completed in time for Y2K. In the District's preliminary contingency planning, it learned some lessons about how no system acts alone. For example, in looking at the Internet connection, District personnel decided that it was not critical and that the District could do without it for a few days if it failed. However, a department responsible for a more critical system said that if any item in its system malfunctioned, it would immediately go to the Internet to research solutions and download software patches or upgrades. The Internet connection suddenly became much more critical.

3.3 Assessment

The third major step is the assessment in which items in the inventory are researched or tested to determine whether they are compliant. In some cases this stage involves simply going to manufacturer web sites to determine whether an item is compliant. In other cases, especially for equipment with embedded computer chips, the process is involved and complex, as will be described in detail later in this report. The likelihood of failure and the consequences of failure for each item determine the amount of research and testing required.

3.4 Contingency Plans

The fourth step in the Y2K Program is contingency planning, which the District began in April of 1999. The contingency plans cover not only the potential Y2K failure of District equipment, but also the potential disruption of services provided by any of its business partners.

3.5 Implementation

The fifth step, which is ongoing with the inventory and assessment steps, is implementation. In the implementation step, non-compliant items are upgraded or replaced whenever feasible. If there is any uncertainty about an item's compliance, and there is no simple remedy available to make it compliant, it is further researched and tested or deferred to the contingency step.

4. SYSTEM REVIEWS

This section describes the inventory, assessment/testing, and implementation processes of major systems in greater detail. There are four major systems:

- ▶ The control system includes everything responsible for controlling operations equipment, but does not include the equipment itself.
- ▶ The embedded systems include the operations equipment that have embedded computer chips in them.
- ▶ The Laboratory system includes all of the District's equipment responsible for sampling and testing, inside and outside of its laboratory.
- ▶ The business system includes all the hardware and software used in District administration and management. These sections will be followed by a discussion of influences external to the District, such as its energy suppliers, and a discussion of contingency planning.

4.1 Control System

4.1.1 Inventory

The control systems for each plant and the collections system are run on two Digital VAX servers running on an OpenVMS operating system. The treatment plant servers are connected to Programmable Logic Controls (PLCs) by dual redundant lines so that if one line or one server goes down, the system is not compromised. A server or network failure would not affect the operation of plant equipment, because the PLCs operate autonomously. Controls can be set through the Supervisory Control and Data Acquisition (SCADA) system on the workstations, but most of the time the controls are on automatic, and the SCADA system serves only to record data. The SCADA system runs on CRISP/32 software. There are also some stand alone control software packages for independent systems such as the central generation plants.

Each of the numerous PLCs throughout the plants and pump stations in the collection system has several components that can be arranged in various combinations. Each has a central processing unit (CPU), a power supply unit, a connection unit that links it with the equipment it is controlling and monitoring, and at least one communication component that connects it to the SCADA system. The PCI Division is responsible for programming and maintaining PLCs, and is also responsible for inventorying and assessing all the PLCs in the District for the Y2K Program. The PCI Division inventoried PLCs by recording the model and manufacturer of every PLC's components and the particular combination of components in the PLC.

4.1.2 Assessment/Testing

Digital Equipment Corporation has assured the District that its servers and workstations are compliant, but it recommends that the District upgrade the OpenVMS operating system to version 7.1. The vendor of the CRISP/32 SCADA software states that the software uses operating system dates; therefore, when the operating system is compliant, the software will be compliant. However, to ensure that SCADA system is compliant, the District plans to test the system this summer. The software running the District's central generation plants was found to be non-compliant.

Since the desktop PCs connected to the SCADA system for observations are generally also used for business purposes, and they are covered in Section 4.4. The PLCs have undergone extensive assessment and testing. First, the programming code in every PLC was scanned by PCI staff for date codes. None were found. Since the PLCs are so important to plant operations, they were also tested. The District has spare PLCs, so none had to be tested while online. The PCI Division built test racks for different combinations of PLC components and tested them by forcing the date forward to observe critical rollover dates. Every combination of PLC components in use in the District was tested in this way, and no problems were discovered.

4.1.3 Implementation

The OpenVMS operating system on the VAX servers will be upgraded to Version 7.1 this summer. As of yet, the only other Y2K compliance problem was the central generation plant's control software, which has already been upgraded to a compliant version.

4.2 Embedded Systems

The embedded systems review process was complex because of the great number of items to be reviewed. Throughout the process, there was the chance of something being missed, so the District tried to give every device in the plants at least two chances to be reviewed. Figure 1, Embedded Systems Review, illustrates the embedded systems review process.

4.2.1 Inventory

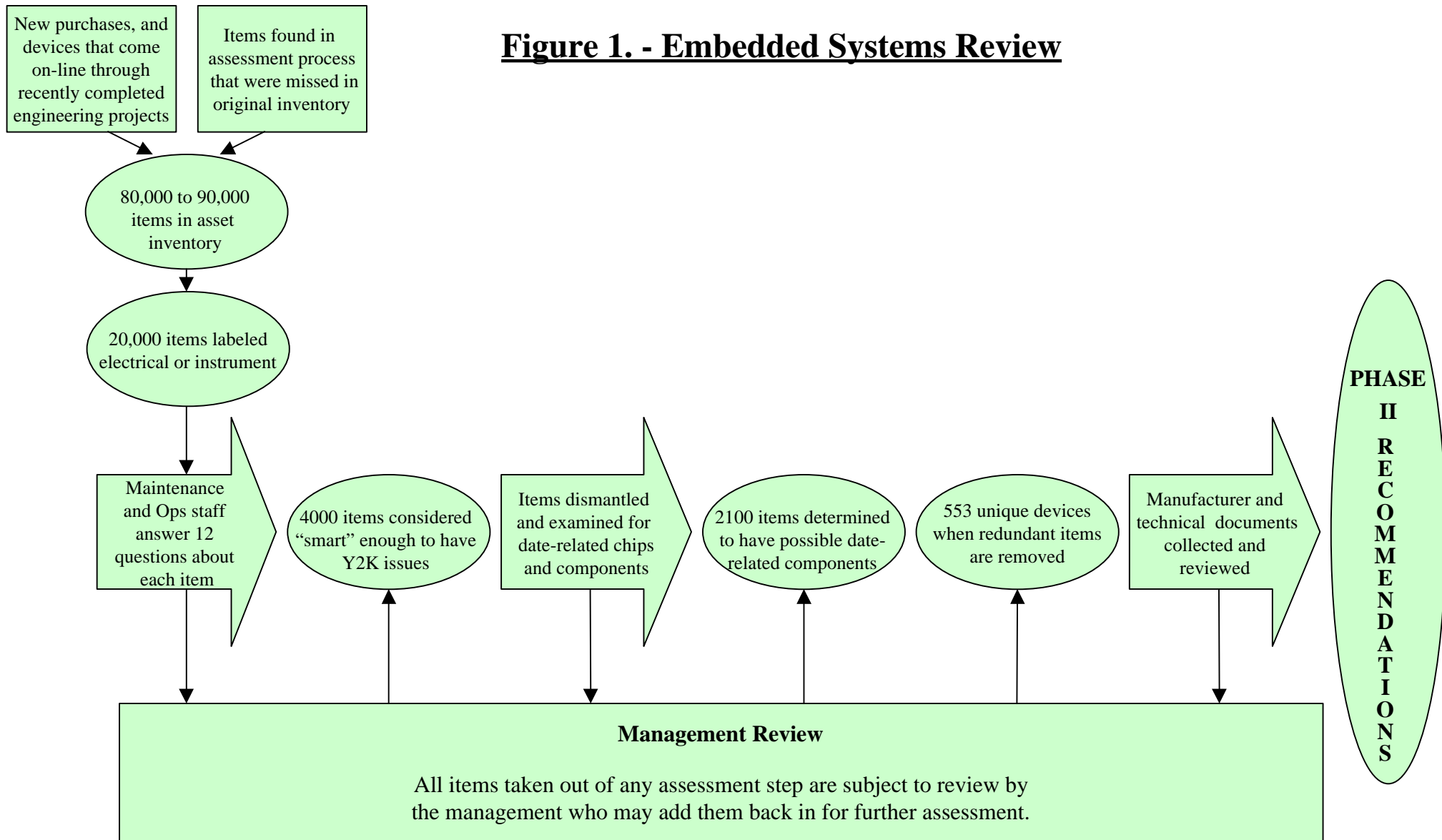
The District had an existing asset inventory that contained 80,000 to 90,000 items. Every item in the inventory was categorized, and the District decided that the only items that could be affected by Y2K would be in the "electronic" or "instrument" categories. These two categories contained about 20,000 items. Most inventories of this type have about a 2 to 3 percent margin of error, and the District estimated that its inventory has somewhat more error than that margin. Therefore, throughout the inventory and assessment processes, personnel attempted to find items that were not included in the inventory. All items that had been assessed received a sticker. Midway through the assessment process, a team walked through both plants looking for items that had not received a sticker and were not in the asset inventory. About 48 devices in need of review were found in this walkthrough. When assessing items in the field, the team always asked the maintenance or operation staff for the area whether anything had been missed. Numerous items were found in this way. The inventory and assessment processes not only helped with the Y2K assessment but also helped refine the District's asset inventory for future use.

Any item that was the responsibility of another department (such as the PLCs, which are reviewed by the PCI Division) was transferred from the embedded systems assessment. These transferred items were put into one of two categories at the end of the assessment: By Others - Miscellaneous or By Others - PLC. These categories will be described in more detail below.

4.2.2 Assessment/Testing

The District received offers from Y2K "database" consultants to perform the assessment. These consultants have large databases of equipment items and compliance statuses, so that any District item that is in the consultant's database could be quickly checked for compliance. The

Figure 1. - Embedded Systems Review



consultant would separately assess any District item not already in the database. The District was skeptical of whether any of these databases would contain exact matches of the District's devices, and it did not believe that an outside firm would be as able as the District in its assessment. Therefore the District chose to assess the embedded systems in house, with the help of Bristol Systems, Inc.

The assessment was conducted in three phases:

- ▶ Field Survey
- ▶ Research on Potential Non-compliant Items
- ▶ Testing

Field Survey. The database of 20,000 items was given to the maintenance and operations staff, who were asked to answer 12 questions about each item. The 12 questions were:

1. Does it have a battery?
2. Does it have a date/time display?
3. Does it have a keyboard?
4. Does it have a serial port?
5. Does it have a net connection?
6. Does it have a microprocessor?
7. Does it have a system management interface?
8. Is it programmable?
9. Does it have date dependent functionality?
10. Does it schedule its own maintenance?
11. Is it critical?
12. Is it still in use (not retired)?

A "yes" answer to any of the first 11 questions coupled with a "yes" answer to the last question sent the item on to further assessment. All items that received all "no" answers to the first 11 questions and "yes" to the last question were sent to management for review. The District's Operations management knows the risk of failure of each piece of equipment, so if there were any doubts about a particular item being taken out of the assessment process, management could add it back in for further assessment. This management review proved to be very helpful. Some items that were taken out of the assessment process because they were considered to be too simple to have Y2K issues, such as power relays, were added back in by management and were later found to be non-compliant.

Approximately 4,000 items needed further assessment. These items were all physically examined by Bristol Systems experts for date functionality, clock chips, and CPUs known to have embedded clocks. Items that appeared to have no chance of being affected by Y2K were taken out of the assessment for management review.

Research on Potential Non-compliant Items. Approximately 2,100 items were passed on to Phase 2, but many were redundant. Some items were redundant because there were several instances of the same model in the District, while other items were redundant due to data entry problems. When the redundancy was removed, 553 unique items remained.

In Phase 2, personnel sought to collect at least two sources of information on each item. Manufacturer data was collected by accessing the Y2K section of the manufacturer's web page or by contacting the manufacturer directly and asking for written information about the compliance status of each model the District owned. In some instances District personnel asked to talk to qualified engineers about the possible Y2K issues a device could have. Technical information was also sought for each device. This information was often found in the Operations and Maintenance manual, which the District either already had or obtained from the manufacturer. Circuit diagrams were also used for insight into the device's functionality. All information was rated for quality. Once all the information was reviewed, items were either put into one of the following five assessment categories or were passed on to Implementation (Section 4.2.3).

- ▶ **By Others - Miscellaneous:** This category consists of items that are the responsibility of other organizations or departments.
- ▶ **By Others - PLC:** All PLCs are the responsibility of the PCI Division, so they are not part of the embedded systems review.
- ▶ **Continue Phase II:** These items need additional inspection or research before a recommendation can be made. The District may be awaiting more information from the manufacturer or still reviewing the available information.
- ▶ **No Further Action:** Reliable manufacturer and technical information was found for these items, and they indicate that the device will have no Y2K problems.
- ▶ **System Analysis:** These devices alone probably do not have Y2K problems, but they may encounter problems with the passing of bad dates from/to other pieces of equipment. In these cases, the whole system must be analyzed and tested together, possibly with outside help. For example, the District plans to have the manufacturer test the two generation plant's systems this summer.

For the most critical systems, like headwork's pumps, Bristol Systems and District staff wrote detailed reports on everything that affects the system and could possibly cause it to fail on critical Y2K dates. Although they found no Y2K issues, they did find some single points of failure that were not recognized before. (With critical systems the District attempts to have redundancy in every aspect of the system.)

Testing. These items cannot be confirmed as compliant and they are critical enough to warrant the cost of testing. These items were passed on to Phase 3 of the assessment.

Testing can be done through a number of processes, but generally, one representative model will be taken offline and tested by forcing the date forward to critical dates. If it is deemed necessary, other like devices may be tested later. Since testing is expensive, Phase 3 is performed only on critical devices for which other options are more costly or unavailable.

4.2.3 *Implementation*

In the Implementation step, items were placed in one of four categories:

- ▶ **Contingency Plan:** These items show some indication of possible problems but are not critical to operations and can be easily fixed or replaced, if broken, with little or no disruption to business as usual. These items are scheduled to be checked for problems on critical dates. There are currently about 200 in this category, and the District expects that the category will stay this size through the end of the year as some new items are added and some are moved to other categories.
- ▶ **Upgrade Software:** For these items, the current software is non-compliant or uncertain, and new, compliant software is available. Currently 17 items are in this category, most of which are uninterruptible power supplies (UPSs).
- ▶ **Upgrade Hardware:** These are cases in which a chip or other hardware is non-compliant or uncertain, and new, compliant hardware is available. There are currently 45 items in this category, most of which are power meters and monitors.
- ▶ **Replace:** These items may be non-compliant, but upgrades are unavailable. For these items it may be less expensive to replace them than to test them. For example, the auto-dialers at several lift stations are currently in the Contingency Plan category because the District does not have sufficient information to confirm them as compliant. The District is considering replacing the auto-dialers, however, because of their importance. Upgrades are not available, and it would be less expensive to replace them than to test them. However, thus far no embedded equipment has been replaced due to Y2K.

4.3 **Laboratory**

4.3.1 *Inventory*

The District has a large, sophisticated laboratory that does the majority of their testing and analysis. They perform some daily sampling and testing, quarterly testing of industrial dischargers, and some long-term sampling and testing in the ocean around the outfall pipe. Personnel inventoried about 250 devices that were sophisticated enough to have Y2K issues. Some of the equipment is run by specialized software that runs on PCs that are several years old. In addition, many pieces of field equipment for sampling and testing were inventoried. Much of the laboratory equipment is connected to a Laboratory Information Management System (LIMS) from LabWare. LIMS is linked to an Oracle database.

4.3.2 Assessment/Testing

The older laboratory equipment had a very high percentage of Y2K compliance problems. About 40 percent of the equipment was found to have potential Y2K problems. Many could also be confirmed as non-compliant.

LabWare stated that the LIMS is compliant, but the District has done some preliminary testing of it to be sure since the LIMS is one of the most critical parts of the Laboratory's operations. The District is currently debating whether to test any other items in the Laboratory. While the Laboratory is important to the overall Mission of the District, it is not critical to short-term treatment operations, so the District is not as conservative in assessing its Y2K compliance.

4.3.3 Implementation

The Laboratory staff took a different approach to implementation than the other departments in the District. For the most part, the Laboratory did not spend as much time doing the assessment of their equipment. Because the size of the Laboratory's inventory and the complexity of some of the instrumentation, the equipment was divided into three categories: 1) equipment that must be replaced without testing because there were known Y2K problems, 2) equipment that must be assessed because they were critical to the Laboratory processes, 3) equipment that would not be assessed because they were of little Y2K risk or were not critical to the operation of the Laboratory. Approximately \$420,000 was spent on new equipment in category 1. Much of this equipment was older and approaching the end of their useful life. Proof of Y2K compliance was a condition of the purchase for all of the replacement equipment. The assessment of the equipment in category 2 is nearly complete and no apparent Y2K problems have been found.

4.4 Business Systems

4.4.1 Inventory

Other Y2K non-treatment systems were put through the Y2K process. The building heating and cooling systems, security systems, closed-circuit television system, fire detection and alarm system, District vehicles and their smog testing equipment, fuel management system, landscape watering system, leak detection equipment, and portable gas detection equipment were also inventoried.

The administrative areas of the District have a great deal of sophisticated hardware to be inventoried for Y2K. The District has about 500 Dell PCs and approximately 50 Dell laptops. The laptops are difficult to inventory completely because some are connected to the District network only occasionally and may be kept in a maintenance shop or office when not being used. The District also has one IBM AS400 computer that runs the financial software. Other office

hardware that must be inventoried includes the network infrastructure, printers, copiers, scanners, and uninterruptible power supplies. There is also a great deal of communications equipment throughout the District that must be assessed, for example, fax machines, internet connections, a telephone system at each plant, pagers, and two-way Motorola radios.

All District PCs run on the Windows NT or Windows 95/98 operating system and have Microsoft Office software. Also approximately 200 other applications need to be inventoried. The District's software inventory has been updated for the Y2K review. An application called ZAC has been installed. ZAC inventories all software on the network on a regular basis, and this has been found to be very helpful. Outside the NT network, the Human Resources and Source Control Departments have a few workstations that run on an older Novell network. These are no longer used for current data but are necessary for accessing historical data.

All financial software is in one software suite from J.D. Edwards that has several modules. The software is continuously being upgraded and added to, which can make inventorying and assessing difficult. There is an expected lull in activity this summer, however, which will allow the District to freeze the system for testing. Further system enhancement and upgrade will occur after the New Year.

4.4.2 Assessment/Testing

The major systems have a project leader in charge of assessment. Both systems have been upgraded and are currently compliant. The assessment and testing of many systems, such as the security system and fire alarm system have been completed. Other systems are still being assessed, and potential Y2K issues have been identified. The pump stations are being assessed with particular diligence because a failure in one of these could result in some localized flooding. Each pump station has a UPS, and several stations have fixed generators. Both of these types of equipment are known to potentially have Y2K issues.

All the District's desktop PCs are less than 5 years old. The District has an "obsolescence" program for computers whereby it replaces all PCs more than 4 years old. However, the District is discovering that even relatively new computers can be non-compliant. Its 100 MHz, Pentium-based computers are its oldest PCs, and they are not compliant. Many of the laptops are also not compliant. However, the bulk of the PCs are compliant, and IBM states that the AS400 computer is compliant also. The manufacturers have reported most other office hardware as compliant, although a minor problem was found with the Internet connection.

The IT Department is assessing all common applications, although specialty software is the responsibility of the particular department using the software. The IT Department will act as a resource to departments assessing their own software. IT has found potential problems with numerous applications. It can be difficult to tell whether software is compliant, because manufacturers may not even be sure, and they may change their statements over time. For example, Microsoft has wavered on the compliance of its Windows NT operating system, so the

District has been waiting for Microsoft to decide which service pack is compliant before updating all the computers on the network.

Novell has stated that its software is not compliant and must be upgraded. J.D. Edwards, on the other hand, has stated that its financial software is compliant. The IT Department wants to test the financial package to be sure. IT has tested some modules, but since the software is being modified, IT has not been able to test the entire package as it will be configured on January 1, 2000. As mentioned earlier, the system will be tested this summer after a planned freeze.

4.4.3 Implementation

The District is currently in the process of either replacing its Pentium-based 100 MHz PCs or upgrading the BIOS, depending on which solution best fits the needs of each situation. Replacement and upgrading of laptops is also well under way. The Internet connection has been upgraded to be compliant.

Non-compliant software can usually be easily fixed by upgrading to the latest version. Some of these must be purchased, but many smaller Y2K upgrades, such as the latest service packs from Microsoft, can often be obtained without cost on the Internet. The District's Windows NT software is currently running on Service Pack 3, and it is debating whether to upgrade to Service Pack 4 or 5. Bristol Systems, Inc. tried upgrading its systems to Service Pack 4, and many of its applications malfunctioned as a result, so it is advising the District against the upgrade. As was stated above, the District will probably wait until Microsoft is more certain of its compliance statements before deciding on a service pack. For statements on the latest Y2K compliance statuses of Microsoft products go to the Microsoft web page at (<http://www.microsoft.com/technet/year2k/product/product.asp>).

The IT Department has found that Y2K has provided the District with an incentive to update and clean up its software and information systems. Before the District began its Y2K Program, it had many different versions of each application and some obsolete software. Now all applications are being brought up to the same version level, and obsolete software is being removed. The District expects the increase in software commonality and the greater capabilities that higher version levels bring will not only increase the sophistication of District users but also decrease the workload of the IT Department's help desk.

5. EXTERNAL INFLUENCES

5.1 Source Control

The District considers itself to be a leader in source control, and it has won national awards confirming this leadership. The District performs quarterly site inspections of industrial dischargers and tracks their compliance carefully. When excess dischargers are detected in the system, the District can usually trace the discharge back to the discharger in very little time. In preparation for Y2K, the District sent a letter to all the industrial dischargers stating that it would

be inquiring about Y2K preparations at its next site inspection. Then, at each site inspection, the District asked the discharger to explain how it was preparing its pretreatment systems for Y2K. The District also gave a seminar on Y2K for dischargers, which was very successful.

5.2 Vendors

It is important for the District to be informed about its vendors' Y2K preparations so that if one does not look like it will be ready, the District can replace the vendor with one that is more prepared. It was each department's responsibility to contact its vendors. Bristol Systems drafted a form letter for departments to use and advised that letters be sent only to critical vendors. It reasoned that if a department sent letters to all its vendors, it might not be able to follow up sufficiently with all non-responders to get meaningful results. Therefore, departments sent letters only to the critical vendors with which they could follow up if they did not receive responses.

6. CONTINGENCY PLANNING

For contingency planning the District uses its Integrated Emergency Response Plan (IERP), which is a program that meets the California Office of Emergency Services requirements, thus allowing the District to be reimbursed for expenses incurred while responding to emergencies. Communications Performance Group, Inc. (CPG) developed the District's IERP. The IERP program trains participants in standardized emergency response procedures and contains specific plans for responding to emergencies. The District developed a plan to handle high flows resulting from El Niño in 1997, and it was very successful. Soon after personnel completed practicing the plan with tabletop exercises, they experienced the highest flows in District's history. They handled the extreme volume, without any problems—a feat they attribute to their contingency planning. The IERP contains contingency plans for many different emergencies, and the District is now starting to develop a specific plan for Y2K. To develop the plan, CPG and the Safety and Emergency Response Division works with all Departments that could be affected.

6.1 Staffing

The District plans to model its Y2K staffing plan after its high-flow plan. There will be two shifts, the first from 6:00 p.m. on December 31 to 6:00 a.m. on January 1, and the second from 6:00 a.m. to 6:00 p.m. on January 1. If all is normal by the end of the second shift, staffing levels will return to normal. The staffing levels will most likely include the same elevated numbers of maintenance and operations staff as the high-flow plan with the addition of more IT staff.

During the first shift, staff will be on alert for problems and will check all the equipment that was left in the Contingency category of the embedded systems assessment. In addition to having elevated staffing levels for the Y2K rollover, the District is not allowing vacations from the last week of 1999 through the first week of 2000 for selected maintenance, operations, and IT staff. There will also be slightly elevated staffing levels on February 28 in case of problems with leap year.

The IERP includes the use of an Emergency Operations Center (EOC). The EOC is a room where leaders can plan responses to problems found in the field and can direct response teams. The District has a room designated as an EOC at each treatment plant. These EOCs are supplied with cell phones, two-way radios, laptops, and SCADA stations and can be activated at a moment's notice. The Plant No. 1 EOC will be activated and staffed for the first shift on New Year's Eve. The Plant No. 2 EOC will function as a command post.

6.2 Energy and Other Services

The District already has a plan for electrical outages, but this plan is currently being expanded to apply to all utility outages. Some of the systems are dependent on water supply from outside suppliers. Some of the District's energy needs are met by natural gas since one of the central generation plants relies on about 35% natural gas as fuel. It also depends on telephone and cellular service providers for communications, and on other private service providers such as its biosolids trucking service. The District feels that its service provider contingency plan is useful to have regardless of Y2K, because it could experience disruptions with one or several of its service providers at any time. Y2K has provided the motivation to ensure that this plan is in place.

The District's plants do not rely on electricity from Southern California Edison since the District is a net exporter of electricity. Electricity from the grid is considered a backup in case the central generation plants fail, but the District plans to disconnect from the grid on New Year's Eve to protect its systems from any electrical surges. Southern California Edison agrees with this decision because it is more concerned about having too much energy on New Year's Eve, with many people cutting electrical load or switching to generators, than having too little. Critical equipment at the plants are still connected to diesel generators as backup in case the central generation plants and Southern California Edison fails.

The District does not have fixed generators for 17 of its 22 pumping stations, however, and they do not receive power from the central generation plants. The five pumping stations with fixed generators have automatic switches that turn the generators on immediately when voltage from the grid drops. All the other pumping stations are equipped with quick-connect switches that allow mobile generators to be hooked up quickly and efficiently. The District currently has three mobile generators, and it is purchasing several more so that it will be prepared for a substantial outage. The District is currently working on a rotation plan for the mobile generators in case of an outage affecting multiple pumping stations. Some of the pumping stations have only 10 minutes of capacity in their wet wells, so a rotational strategy for these stations may not be possible. Nevertheless, the District is confident, that with the generators it has and the new ones it is purchasing, it will be ready to handle the most likely scenario of a series of rolling outages.

Although the District is preparing contingency plans for a total outage, from talks with Southern California Edison, it believes that the most likely scenario will be rolling blackouts or brownouts, not a total area blackout. Therefore, it is talking with the electric utility to determine

which pumping stations are on the same transmission lines so that it can determine the likelihood of multiple pumping stations in the same vicinity losing electricity.

The District cannot put fixed generators at every pumping station because in most places it does not have enough real estate to do so. The generators it currently has are well maintained with monthly tests and occasional full-load tests. The District must monitor its generator use carefully because South Coast Air Quality Management District regulations allow it to run its generators only for a certain number of hours each year.

The District is also designing a fuel plan to accommodate the generators' needs and the fuel needs of its trucks and other equipment. It plans to top off all storage tanks late in December and will assess the need for more fuel in case the local fuel depots cease functioning due to Y2K. It also plans to ensure proper inventory levels for other supplies such as chemicals, spare parts, laboratory supplies, and other supplies that will allow the District to stay self-sufficient for a few days.

The Finance Department is working on contingencies, but fortunately the timing of certain transactions will allow it a few weeks of leeway in working out any Y2K problems it encounters. The District receives its quarterly receipt from the County in mid-December, and its biweekly payday is the Wednesday before the rollover. It is currently working on moving other transaction dates away from New Years as well.

The District plans to complete its contingency plans this fall, which will allow enough time to practice with tabletop exercises. The District considers itself a leader in contingency planning and is taking Y2K preparations very seriously so that it will be as ready as possible for any unforeseeable problems.

Appendix: Critical Y2K Dates

<u>DATE</u>	<u>REASON FOR CONCERN</u>
01/01/1999	Systems that look one year ahead may fail.
04/09/1999	Special-use Julian date (99 th day of the 99 th year).
07/01/1999	Many governments begin their fiscal year.
08/21/1999	Global Positioning System date rollover affects military, transportation, Geographic Information System, and Automatic Vehicle Locator.
09/09/1999	Programmers use 9999 as an end of file or infinity; will cause numerous problems (ninth day of the ninth month of the 99 th year).
10/01/1999	Federal government and others begin FY 2000.
12/31/1999	End-of-year baseline (to be used in rollover scenario).
01/01/2000	Date rollover will halt, confuse, or otherwise disrupt many systems and devices.
01/02/2000	First 24-hour look-back period.
01/10/2000	First date requiring full use of seven digits.
02/28/2000	Day prior to Leap Year (to be used in rollover scenarios).
02/29/2000	Many systems will not recognize Leap Year in 2000.
02/30/2000	Invalid date. Test to ensure that Leap Year logic is functioning.
03/01/2000	First valid date after Leap Year.
10/10/2000	First date requiring full use of eight digits; may cause failures.
12/31/2000	Some systems using Julian dates may not recognize the 366 th day of the Leap Year.
01/01/2001	First date in 2001. Check rollover functions.

Sources: Texas Guidebook 2000 and California Year 2000 Embedded Systems Program Guide.